TRADE-OFFS IN THAILAND

In the 1990s, Thailand has emerged as one of Asia's "little dragons"—at $2,400 U.S., its gross national product per capita is up 2,000% from 1961. Average life expectancy at birth is 70 years. A successful family planning campaign has dropped population growth to just above replacement level. Literacy among adults approaches 85%. *The Economist* has projected that by 2020 Thailand will have one of the world's ten largest economies (along with six other Asian nations). Thailand is undergoing profound transformations—social, political, and environmental—in a startlingly short period. And by many measures, these changes have been for the better.

Most Thais are blunt about the costs this boom has entailed. "The past thirty years of Thailand's development have been geared toward economic growth. As a consequence of this growth, natural resources have been depleted, and pollution problems have intensified," states a 1995 report by the Thailand Environment Institute (TEI).

In its transition from agricultural to industrialized economy, Thailand's changes and the related problems echo those experienced by the United States and other western countries. They also include several the United States has not yet faced. The lessons Thailand is learning about the relationships between the environment, human health, and economic growth may be helpful to other countries.

Problems on the Farm

In the countryside, Thailand's rapid increase in agricultural exports has taken a toll on its once-rich land, forest, and water resources, and on human health, particularly through pesticide poisoning. Planners in the 1960s focused on agricultural exports as a path toward greater foreign exchange and more sophisticated industries. By the 1980s, Thailand was a leading exporter of rice, cassava (tapioca), soybeans, and rubber. These cash crops gave farmers higher returns than subsistence farming but required them to purchase genetically improved seed varieties and heavy doses of fertilizers and pesticides.

Cases of agricultural chemical poisoning have become widespread among farm and food workers. In 1991, tobacco farmers in northern Chiang Mai province reported chronic dizziness and respiratory problems, which they associated with the pesticides. Still, corporate buyers pressured them to purchase and use the chemicals, the farmers said, and the timing of orders by company buyers often forces harvesting to be done closely following spraying.

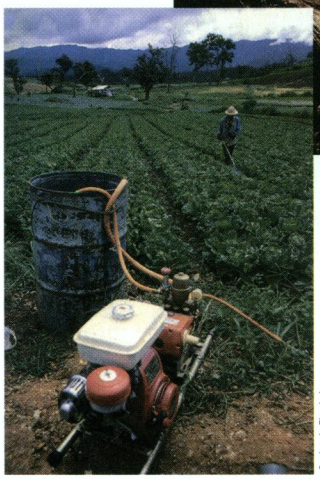
This year, a nationwide study by the Thai Ministry of Public Health found over 69,000 farmers (nearly 17% of those tested) had abnormally low cholinesterase enzyme levels—evidence of exposure to organophosphate and carbamate pesticides. In September, public health officials tested plantation workers in Tak province and found that 271 workers (32%) had high-risk levels of pesticides in their blood.

Since 1977, Thailand has banned 23 chemicals because of their carcinogenic and teratogenic risks, but enforcement is poor and farmers feel trapped in a cycle of debt and the need to use more chemicals to boost sagging yields. In the period 1987–1990, pesticide imports increased by 40% and herbicide imports nearly tripled to 14,518 tons, according to a report in the 1992 book *Integrated Pest Management in the Asia–Pacific Region*, published by CAB International. According to the Pesticide Action Network, an international coalition of citizens' groups from about 60 countries, a number of outlawed chemicals are still being used, including methyl-parathion, monocrotophos, and carbofuran. Even for legal chemicals, it can be difficult for farmers to use them safely because most pesticides are distributed through the private sector, and farmers are given little or no information on their application and health hazards. According to a 1987 article by K. Pumala and S. Viriyanondha in the *Journal of the National Research Council of Thailand*, some chemicals are even mislabeled to conceal the fact that they exceed the UN Food and Agricultural Organization's limits on active ingredient concentrations.

Northern ethnic minorities, or "hill

tribes," are particularly vulnerable to these hazards. Hill-tribe villages in the opium-producing regions that border Burma and China are the focus of programs that seek to replace poppy fields with large-scale vegetable farming. In the pressure for profits, farmer safety gets left behind as farmers in these communities have minimal education to aid them in understanding pesticide labels.

Other byproducts of replacing subsistence crops with higher paying ones have been the sweeping clearance of forests and mounting farmer debt. Crop yields have declined due to soil depletion and poor management, as they did in the United States in the mid-1800s. Farmers must clear forests for new farmland to keep production high enough to repay their debts.



Sanitsuda Ekachai

Vulnerable populations. Hill-tribe villages are the object of large-scale farming programs that may create risks of dangerous exposure to pesticides as farmers are given little or no training in their application or health hazards.

The rise in farm exports masks a growing disparity between rural and urban incomes. In 1993, a farm worker in the north earned just $20 a month, while a Bangkok factory worker took home seven times that, according to the Thailand Development Research Institute (TDRI). This disparity has fostered land degradation as farmers attempt to increase harvests, as well as poorer nutrition, while fueling urban growth that has outstripped the capacity of cities to provide basic services such as garbage collection and clean water. Price ceilings on rice reinforce the disparity by placing an artificial cap on farm incomes.

Nutrition levels have also declined in some rural areas, including the populous northeastern plateau, in part because dietary supplements that families traditionally collected from the forest—mushrooms, fruits, wild vegetables, and roots, as well as insects, fish, and reptiles—are increasingly scarce.

Official explanations still tend to blame deforestation on this cycle of debt and poverty. Lacking official land titles (as recently as 1985, only 20% of Thailand's private land was titled), many farmers cannot obtain reasonable credit for equipment and supplies. Unable to buy fertilizers and fearful of growing debt, farmers clear more forest land for farm production.

But farmers aren't the only ones cutting down trees. Through concessions and dubious development projects, commercial interests have logged many of Thailand's temperate hardwoods. Powered by chainsaws, deforestation claimed over 500,000 hectares a year between 1980 and 1990, and forest area shrank to half of its former size, according to the FAO. Hastily planned dam projects inundated large areas of forest, while other areas were cleared for commercial tree plantations. All logging was banned in 1989 and remains illegal. Nevertheless it continues, masked by overland log imports from neighboring Burma, Laos, and Cambodia.

In the south, rigid economic policies, and government incentives encouraged farmers to convert land to rubber plantations and shrimp farms. "They tell us to clear the whole area and plant only one kind of rubber tree," complained village elder Lon Madlee of Satun province at a 1991 conference of nongovernmental organizations. "If they catch us growing other species, they fine us [about $10] per tree. They are forcing us to destroy the forest."

This transformation of the south destroyed more than half of Thailand's mangroves (from 3,127 km^2 in 1975 to 1,686 km^2 in 1993) along with key breeding sites for many marine species. Vastly reduced forest cover has brought about more severe drought and flooding in the past decade. Observes Mingsarn Kaosa-ard, of TDRI, "Disputes between upstream and downstream water users are so common that they no longer feature in newspapers."

Like the soil, fisheries have been extensively overexploited. Large motorboats can cover larger areas than traditional boats and trawling nets with smaller meshes produce larger harvests that include more immature fish and shrimp, according to TEI's Dhira Phantumvanit. Seafood export factories with inadequate waste disposal have fouled rice irrigation systems

Too many trees? Although logging was banned in 1989, farmers and developers continue to deplete Thailand's hardwoods to make way for cash crops and commercial interests.

David Taylor

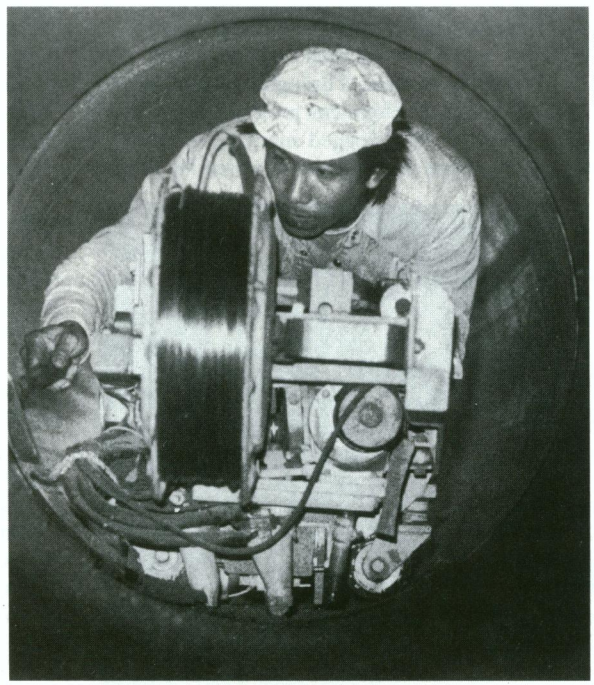
Short-term seafood. Thailand's booming shrimp industry is producing fast profits but also wastewater problems, degraded land, and farmer debt.

and left farmers' fields uncultivable. The lure of fast shrimp profits and the industry's credit and guaranteed market led many farmers to switch to shrimp ponds. After several years of impressive profits, harvests tend to decline and the ponds grow saline, a result avoidable only with large-scale water circulation and fallow rotation.

Watery Abomination

As rivers reach the cities, the water crisis takes a different form. Industrial growth and waste have made water pollution and hazardous waste two of Thailand's most pressing environmental problems. In a proclamation 140 years ago, King Rama IV stated that Bangkok residents "dishonor their own city by throwing carcasses of dead animals into the rivers and canals, where they float up and down in great abomination. . . . By the exercise of a little thoughtfulness it should not be difficult to perceive that other people using the water object to such an exhibition." However, until recently, no overall plan existed for managing water.

From its northern headwaters, the Chao Phraya River is the lifeline of central Thailand and Bangkok. High discharge levels of untreated organic wastes, both industrial and domestic, have depleted the river's dissolved oxygen, which is essential for breaking down pollutants and for supporting fish and other aquatic life. Bangkok's untreated wastewater is carried off by the city's ancient network of canals, called klongs, which empty into the Chao Phraya. In the 1980s, measures of dissolved oxygen in the river's lower 100 km showed danger signals; by 1990, the dissolved oxygen level for one 20-km length of river "was effectively zero," according to TEI. For now, this mainly threatens downstream communities like Pathum Thani and fisheries in the Gulf of Thailand. However, there is also the danger that, in the long run, downstream water problems could seep upstream of Bangkok.



AP/Wide World Photos

All in a day's work. A Thai barge worker welds pipe in a 31-inch diameter space with no safety equipment.

Treatment for drinking water appeared adequate, however, with the main risk existing for the 15% of the city's 7 million people that lacked access to tap water, according to a 1994 World Bank study titled *Thailand: Mitigating Pollution and Congestion Impacts in a High-growth Economy*. The World Bank study found that Bangkok's groundwater holds no significant risk of contamination for those who drink it, thanks to the filtering clay under the city's soil. The city's main groundwater problem is subsidence—in the past 25 years, some areas have sunk 50–55 cm due to groundwater overextraction.

Throughout the country, flood waters during the monsoon pose an annual health hazard, as floods can impair sanitation and contaminate drinking water. In livestock areas, for example, flood waters can spread leptospirosis, a disease communicated through the urine of animals. The epidemiology division of the Ministry of Public Health reported in October 1996 that flood-related diseases in 1995 affected 4,447 people in 22 provinces; these included dysentery (86 cases), typhoid (29 cases), hepatitis A (54 cases), conjunctivitis (477), and leptospirosis (143 cases).

Just downriver from Bangkok lies Samut Prakan, an industrial province where textile and food-processing industries are among the main sources of water pollution, with heavy metal and ammonia loads being particular problems. A 1994 TEI study rated the province's waste discharges into the river by their biological oxygen demand (BOD) load, representing the dissolved oxygen required to decompose waste above the factory effluent standard of 20 mg/liter. By the year 2000, the 240 large polluters (BOD load of over 25 kg/day), 258 medium polluters (5-25 kg/day) and 3,400 small polluters (less than 5 kg/day) will churn out a combined total of more than 10,600 tons of wastes per year above effluent standards. Currently only 3% of factories comply with those standards, according to the New York-based *Engineering News Record*.

TEI calculated that pollution fees levied on the factories could generate $27.3 million each year for wastewater treatment, yet cut no more than 1% of most businesses' profits. Dirtier textile and food-processing industries could expect a slightly bigger slice. Since that information was published, provincial governments have adopted

the "polluter pays" principle. The Bangkok region has begun construction of 170 km of sewers and four secondary treatment centers. According to engineers, the biggest challenge now is digging amid the city's prodigious traffic.

Something in the Air

Bangkok's notorious traffic has created serious air pollution problems. In the late 1980s, high lead levels were a main concern; high blood lead levels can have a permanent effect on the brain and the neurological system. The Centers for Disease Control and Prevention in the United States uses 10 micrograms/deciliter (μg/dl) of blood as an action level for children. According to Choochai, almost all studies related to blood lead levels among children in Bangkok showed levels of over 10μg/dl. A study at one Bangkok hospital in 1989-1990 found, among 82 newborn infants, an average blood lead concentration of approximately 18.5 μg/dl. A gradual shift to unleaded gasoline starting in 1992 has decreased ambient lead levels.

Now, a more serious threat is Bangkok's high levels of airborne particulate matter, according to the 1994 World Bank report. This year, at one of the city's busiest intersections (the site of several construction projects,) the Pollution Control Department recorded an average of 2.18 mg/m^3 of particulate matter—more than 6 times the international standard of 0.33 mg/m^3. The health impacts are intensified by increasingly long commuting times and the fact that air-conditioning is relatively uncommon. Diesel and motorcycle exhaust are the main contributors, along with construction projects—1,883 new projects were registered in Bangkok for 1995—and dusts. Proposals to reduce construction site dust include erecting temporary walls up to 2.5 m high. But of the 100 companies with construction projects in Bangkok, none use effective air-pollution controls. Supat Wangwongwattana, director of PCD's air and noise quality division, told *The Nation* in April, "There are laws and regulations about this but there is no serious enforcement."

The health risk from particulate matter is figured not only by concentration but by particle size—particles under 3.3 microns are believed to penetrate more deeply into lung tissue. Readings from Samut Prakan suggest that these smallest particles account for an average of 50% of total suspended particulate concentrations, a much higher proportion than in the United States where generally only 40–45% of total suspended particulate concentrations are smaller than 10 microns in diameter.

The main danger of this airborne dust is its hazardous fungi, according to scientists at Mahidol University who last December found 14 fungi and 16 bacteria types in airborne particles. "Children, the elderly, and HIV/AIDS patients are particularly vulnerable to dustborne infection," Thepanom Muangman, a professor of environmental and natural resource studies at Mahidol, told the *Bangkok Post* "Longer commuting times and the scarcity of air-conditioning both increase people's exposure to these fungi."

A Wealth of Waste

With growing wealth, Bangkok is generating more solid waste and has outstripped the capacity of its daily collection services. The city's treatment plants are overwhelmed with more than 4,000 tons of solid waste each day; the city's largest dumpsite at Onnuj receives 2,000 tons daily, five times the capacity of its incinerator, according to environmental journalist Sanitsuda Ekachai's 1994 book *Seeds of Hope*. The rest is left in the open to decompose near the homes of about 140 families.

But the main danger is the growing discharge of hazardous waste, most of it from industry and hospitals. In 1994, Thailand's industrial plants churned out an estimated 360,000 tons of hazardous waste, mainly heavy metal sludges and solids (30%) and acidic wastes (29%). The concentration of three-quarters of these factories close to Bangkok's dense population intensifies the dangers of exposure to toxins. The World Bank has estimated that for 1991, infectious waste from hospitals totaled nearly 76,000 tons. In 1995, Thailand had only one hazardous waste treatment facility, which alone could not handle the volume of waste produced.

Horse Medicine and Other Occupational Risks

With Bangkok in the throes of an industrial boom, workers face hazards ranging from lead and airborne dust to noise and stress. Many workers from the poorer rural areas consider these hazards worth the higher wages paid in urban areas. Among factory workers, the most common occupational disease is silicosis; nearly 70,000 workers were at risk of silicosis in 1993, according to Wilawan Juengprasert, the government's director of occupational health. Lead is another prevalent hazard—in some electronics plants with inadequate ventilation, workers have shown blood lead levels five times that of other Bangkok residents.

Textile workers risk byssinosis, a chronic inflammation of the respiratory system caused by cotton dust. About 500 cases are reported each year. At Bangkok Weaving Mills, a 1994 test by the Industrial Works Department found cotton dust levels over 16 times the official standard of 1 mg/m^3, reported the *Bangkok Post* Still, employers often deny the problems and resist funding treatment. Other vulnerable groups include traffic police, who show a proportionately higher rate of respiratory problems from constant exposure to exhaust fumes.

For people raised in the countryside who emigrate to urban cities, the noise and stress of Bangkok's streets may contribute to a risk of narcotics addiction. A 1994 study by TDRI found the highest levels of narcotic addiction among truck drivers (56%), drivers of autorickshaws known as tuk-tuks (41%), and bus drivers (28%).

Sanitsuda Ekachai

Living off the waste. The Onnuj Street garbage mountain in Bangkok provides income for the city's slum dwellers who sort and sell the trash.

Such workers, along with construction workers, who are subject to tight deadlines and piece-rate pay schedules, tended to abuse amphetamines. "It's the horse medicine that's killing us," explained Jamrat Jamsena, a village leader in the northeast. In a 1990 article by Ekachai in the *Bangkok Post*, Jamrat confirmed that drivers and other Bangkok workers commonly use amphetamines (said to give the "strength of horses") to overcome fear (from driving unfamiliar vehicles on unfamiliar highways at high speeds) and drowsiness on their long shifts, as well as to help them deal with adapting to life in a congested, modern city. "A lot of us have to pay off the cost of the fertilizers we borrowed for rice farming," Jamrat said, explaining the urban migration.

Reuters/Corbis-Bettmann

Addictions and disease. Heroin abuse is growing among urban dwellers and contributing to the spread of HIV in Thailand, which is expected to lead the world in HIV cases by the year 2000.

Heroin abuse is also growing among tuk-tuk drivers, fishermen, slum dwellers, and prisoners. It is both a symptom of broader social problems and a significant AIDS risk. The number of injection drug users in Bangkok who are HIV-1 seropositive is estimated at 33–43% of the population. But in the last few years, perhaps the greatest occupational risk is borne by female prostitutes, who are often reluctant or unable to make customers use a condom.

AIDS

By recent estimates, 900,000 Thais are already infected with HIV—as many as in the United States, where the population is four times larger—with 100,000 new cases each year. By 2000, the World Health Organization predicts that Thailand and India will have the highest numbers of HIV sufferers; by 2015, Thailand can expect to have 2–5.9 million HIV cases.

With the prevalence of visits by Thai males to prostitutes, who number 200,000 by a conservative 1994 estimate, heterosexual HIV transmission could have a devastating and widespread impact. By standards of literacy and place in the workforce, Thai women fare better than their counterparts in many Asian countries. But a persistent attitude of tolerance by both women and men of male freedom to have extramarital sex puts the entire society at risk.

Environmental destruction and dislocation have pushed thousands of young women from the countryside to the city to find work in the sex industry, where they often become infected with HIV. It is a graphic picture of Southeast Asia's growing wave of "environmental refugees," a phenomenon that former Thai prime minister Anand Panyarachun noted in a 1994 speech will cause "social and economic disruptions on an unparalleled scale."

Ann Danaiya Usher, a journalist in Bangkok, sees AIDS "as a phenomenon embedded in, and inseparable from, other social realities." In a 1994 paper entitled *After the Forest: AIDS as Ecological Collapse in Thailand*, Usher notes several parallels between the country's ecological and AIDS crises. Both have provoked the "tendency to stigmatize the most disadvantaged, placing blame for the problem on the victims," Usher writes. Prostitutes bore the brunt of Thai society's initial outrage over AIDS; villagers were blamed for the complex factors that caused deforestation. In both cases, initial policy responses were counterproductive because they tried to isolate these groups and deny the extent of the problem. As these "solutions" exacerbated the problems, however, public debates erupted on both forest management and AIDS.

Dealing with the Legacy

Thailand has faced crises before. In the last century, it alone among its neighbors avoided colonization. In this century, it has cut an alarming population growth rate of 3.1 by more than half in just 20 years.

Emerging from the current phase of crisis is a kind of watershed of public and political awareness that began four years ago, roughly coinciding with the passage of the 1992 environment act (officially known as the Enhancement and Conservation of National Environmental Quality Act B.E. 2535). The law overhauled the government's approach to environmental management, consolidating policy command and decentralizing implementation, with the recognition that public participation is key to success. It replaced the Office of National Environmental Board, a weak advisory body, with three task-oriented departments: the Office of Environmental Policy and Planning, the Pollution Control Department, and the Environmental Promotion Department. The law also gave these agencies greater authority to dole out punishment and incentives. The result, observes Wanee Samphantharak, deputy director of Environmental Planning, is "a mixture of sticks and carrots as well as dialogues and consensus strategies."

The "sticks and carrots" include the designation of environmental protection zones and pollution control zones, which obligates provinces to draw up an action plan for environmental protection. To date, designated zones include Samut Prakan, and the coastal resorts of Hat Yai, Pattaya, Phuket, and Phi Phi Island. About $170 million from a new Environmental Fund has gone to sewerage and solid waste management in these places.

Thai planners are also exploring policies ranging from polluter-pays to revised accounting systems that assign costs to environmental degradation. Planners and economists have realized that the omission of environmental costs in the country's balance sheets has skewed the growth they planned in the 1960s. "By neglecting the proper valuation of benefits from nature, conventional economic thinking tends to rank forest conservation projects well behind development projects," whose benefits are more easily calculated, notes

TDRI's Mingsarn. On the other side of the ledger, a 20% improvement of overall air quality would have an estimated $3 billion worth of health benefits, the 1994 World Bank study concluded.

More Public Participation

Reacting against the centralized planning that created environmental problems for Thailand, grassroots action and public debate have opened many issues, along with the old assumptions of economic growth, to closer scrutiny. Several years ago village protests in the northeast succeeded in getting the governor to halt "reforestation" programs that displaced villagers to make room for commercial tree plantations. A growing number of farmers have turned away from agricultural chemicals to safer pesticides made from neem (*Azadirachta indica*) and other plants.

"Environmental problems are local problems," states the report of TEI's 1995 annual conference. The national government should provide regulations on issues like emission standards and otherwise support local initiatives through the Environmental Fund established in 1992. "[T]he financial limitations of the local administration [are] an issue that has long been neglected by the central government."

In the search for AIDS vaccines, Thailand has moved forward. Following a decision by the U.S. National Institute for Allergies and Infectious Diseases in June 1994 to delay tests of two vaccines, Thailand decided to conduct the tests itself. For this it has the support of Genentech and Biocine (the vaccine manufacturers) and international agencies. Depending on the results of the first small-scale trial, Thailand may launch an efficacy trial with 2,500 drug users late this year.

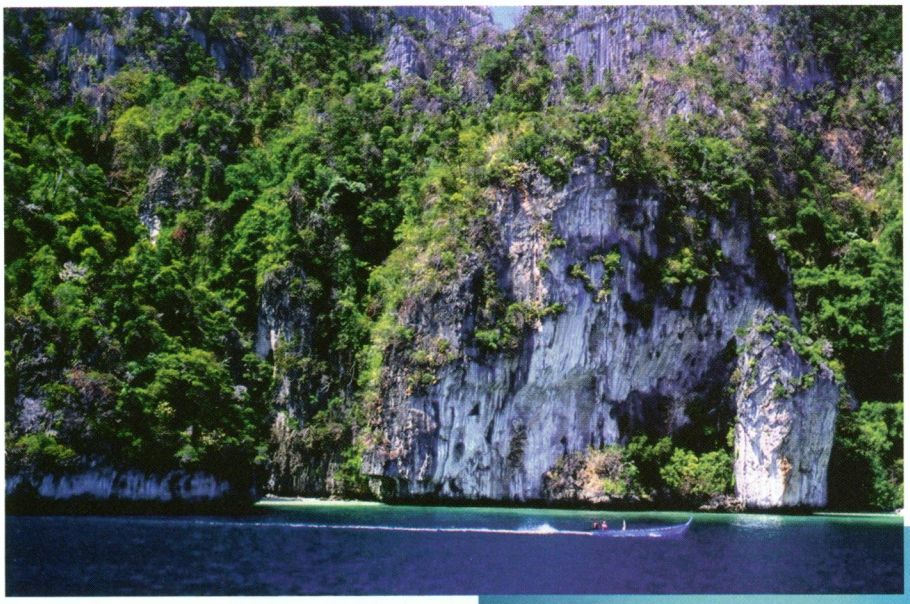
Public education on health issues, particularly AIDS, has evolved creatively and is showing results. From denial and grisly posters of hooded skeletons with syringes dripping blood, government campaigns on AIDS eventually shifted to more focused warnings for women, showing a pregnant woman's concerns for the health of her unborn child. Empower, a nongovernmental organization that trains prostitutes in alternative work skills, has conducted street theater in which a mime engages bar patrons in a shell-and-pea game to playfully promote the use of condoms.

The effort may already be paying off. Infection rates among army conscripts appear to be dropping, as the proportion of men visiting prostitutes drops and the use of condoms rises, according to a study by a team of scientists from Johns Hopkins University, the Royal Thai Army, and Chiang Mai University, published in the 1 August 1996 issue of the *New England Journal of Medicine*.

The Thai press, one of the freest in Asia, has played a major role in the public dialogue. Environmental reporters like Sanitsuda Ekachai and their editors have brought complex issues into focus. "In the West, the law is probably the most important advocacy tool for environmental concerns," observed James Fahn, environmental editor for *The Nation*, at the Fourth Pacific Environmental Conference in 1994. "But in Thailand the press has often served as the court of last resort." With the 1992 environmental legislation, he acknowledged, this is changing slowly. "Information leads to transparency. Transparency exposes corruption. And corruption is one of the greatest causes of environmental destruction," he says.

Social disruption underlies the health and environmental problems that have followed Thailand's rapid economic changes. In its response, the country's public forums and the urgent need for innovation may be its greatest strengths.

David Taylor



New value for ancient resources. Under Thailand's main environmental law, a system of planned development has begun including the designation of coastal resorts such as Phi Phi Island (left) and Phuket (right) as environmental protection and pollution control zones.